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off in thin sheets. It is also associated with other rock-forming materials, and in this way makes schist or a mica pudding stone.

Hornblende, called amphibole by some mineralogists, is not so common in Kansas, and is, as far as I am able to find, found only as an accessory of other rocks. It can be identified by its hardness, its shiny black luster, and its flaky appearance. It has some of the characteristics of mica and is sometimes mistaken for it, but a close examination will show that it is much harder than this substance. Mica can be crumbled with the thumb, but not so with hornblende. In chemical composition it is a silicate of magnesia and is about the same in composition as asbestos, to which it is closely related. Hornblende, like asbestos, is a heat resisting material and fire will have no effect on it.

These, then, quartz, calcite, feldspar, mica, and hornblende, are the great mother classes of rocks most common in our state. There are still others, and some of large importance, found here, but these will suffice for this, our first lesson. If we would give a small amount of time and study to these suggestions and compare specimens of each, it would not be long until we would be able to name and distinguish most of our common rocks. This is a knowledge which any one should be glad and proud to possess. We take great interest in many of the studies of the natural world less interesting than this. And what can be more fascinating than an intimate knowledge of the beauty and utility of those massive structures of rocks hidden deep in the bowels of the earth, or here and there exposed to our view, or now and then crystallized and variegated with a beautiful play of colors, as it were, to make us admire them? This is a science that will give pleasure and profit to its student, will take him to the hills and canyons out in the open world, away from the conventions of man and alone with nature.

Home City, March, 1918.

Sternberg's Expedition to the Red Deer River, Alberta, 1917.

CHARLES H. STERNBERG.

In all my experience as a collector, this has been the most successful expedition of my life in the fossil fields of North America. It has also been one of the most strenuous ones. I received sufficient income the year before from my labors for the British Museum to enable me to employ five men part of the time in the fossil field, and to purchase a team and outfit, so I was independent in regard to transportation. Then the season was ideal for the fossil hunter. We had a severe drouth, little rain falling in the fossil beds. This fact also relieved us from the awful pest of a rainy season, the mosquitoes. I might also say, that another strong incentive to labor was the presence in the Sand creek beds of a competitor, even though he chanced to be my own son, Charles M., who was conducting a party for the Geological Survey of Canada. All these causes, and above all others the energy of my assistants, who gave their unremitted labor from sunrise to sunset, not even taking the time to go fishing during the hours we could work in the field—these causes, and my perfect health and strength, combined to make up the success of last year, even though we went into a country that Barnum Brown, the greatest living collector in America of reptiles, had spent four years in exploring. We found his tracks everywhere, and the network of roads he had built through the bad-lands was of inestimable value to us. Further, on account of our having two outfits in the same field, we were able to assist each other in hauling our finds out of the canyon of the Red Deer river, about 600 feet deep, to the prairie above. My most remarkable discovery was a very complete articulated skeleton of the carnivore *Gorgosaurus libratus*, of Lambe. A larger specimen of this species was discovered by my son, Charles M., in 1913, in the same general region. This has been used by Mr. Lambe as his basis for a memoir published by the government of Canada. My specimen lay on the surface. The upper left ribs and front limbs were destroyed by erosion. A small portion of the end of the tail also is missing. The head and neck were turned back, so the head lay parallel with the illia. The tail, too, was curved towards the head. The abdominal ribs are present for the first time in the history of Cretaceous carnivors, and in position. There seems to be fourteen sets of four each. The right front limb, present and complete, is less than 20 inches long. The ulna is only 4½ inches long, while the metatarsals are 20 inches long. The hind limbs are complete except a few distal phalanges. The skull is normal, with very narrow muzzle. About twenty-seven caudals are present. The illium is about 25 inches long. This specimen is No. 5 in my collection.

The second specimen, discovered by my son and chief assistant, Levi, is a remarkable example of the plated dinosaur *Palæoscincus costatus* Leidy, known only to me by single teeth. The type was one of the famous teeth Dayden had in his vest pocket, when he was run out of the Judith river beds by Black Feet Indians about 1848—the Belly river series of Sand creek, Red Deer river, Alberta. From this region my material came and is of the same age (Pierre) as the Judith River Bells of Montana. This specimen is one of the largest, if not the largest, of the Pierre plated dinosaurs. The entire skull and mandibles are present. Back of the skull are the two half rings of anchylosed plates, and near them another set. Both heads of the scapulæ, with one front limb, are present in place, and enough plates lie slightly disassociated to restore correctly the dermal armor of this huge reptile for the first time to its shoulder. The third set over the neck consists of a central plate with cone-like projection over the dorsal spine, 9 inches long and 6 inches at the base. Along the median line joining this on either side, are great bony plates 26 inches long, 9 inches wide, and an inch and a half thick where they join the middle plate, increasing in thickness to three inches where the great horn-like projection begins to develop. This projection is cone-shaped and a foot long. The ones that follow are still larger. One of the terminal plates is 16 inches long, a foot wide and 9 inches at the base. It is hard to imagine what those over the body measure. The body of these sluggish creatures is as round as a barrel. Some of the ribs are anchylosed to the center of the vertebræ. Beneath the body the plates are either very small, or made up of many rows of small nodules of bone, that were arranged like chain armor giving mobility to the skin. In this specimen they may be seen for the first time in place. I have seen a pelvic arch of one of the huge creatures six feet across. Some of the ribs are over five feet long.

We secured three *Ceratops* skulls, one of them new. This last is remarkable for its beautiful crest. It is oblong in form, measuring 2 feet 11 inches from the back margin of the orbital opening to the distal end, and it is 28 inches wide. The armature along and behind on the margins of the crest are remarkable, and must have been covered with horn, and made a very formidable weapon of defense. This is No. 48 of my collection.

No. 17 is a very beautiful section of the body, taken from a mold made soon after burial in the clayey sands that covered it. A cast was taken at burial. As the organic remains shrunk and decayed, sand, taking its place, took a perfect cast of the original body. Even the wrinkles of the skin, the shadowy marks of the ribs below, the form of the muscles, and the fat layers along the back, are as perfectly reproduced as if the dead saurian lay before us. Over six square feet of back and flanks are present in hard iron stone. That will last forever and a day. This is a specimen of the peculiar *Stephanosaurus marginatus* Lambe, of which species I had the honor to discover the type in these beds in 1913.

The specimens enumerated above were sold to the American Museum of Natural History, New York, on the recommendation of Barnum Brown, who came here last Christmas to see them.

Another fine specimen is of the crested duck-bill *Corythosaurus casuarius* B. Brown. The type, now mounted in the American Museum, New York, is the finest specimen of a duck-billed dinosaur known. It was preserved in a swimming posture, and with the "mummy" I sold to the American Museum, prove conclusively what I have always believed, the trachodonts are swamp-swimming and feeding reptiles, instead of land, tree-browsing reptiles, as taught by Cope and Marsh.

I have a fine skull. The predentary and a small part of the back of the high crest are missing. It is 2 feet long and 22 inches high in the center of the crest, which is like a helmet, with narrow ridge in center. Or like the Cassowary, from which resemblance Barnum Brown gave it its name. There are eleven continuous vertebræ back of the head, and four scattered dorsals, and twenty-four caudals. The complete sacrum, from under part of centrum to top of spine, is 16 inches. Both illia, pubic bones and ischia are present, the latter with large footed distal ends, and are 3½ feet long, with both femora, 3½ feet long, tibia and fibula, 3 feet 3 inches long, and two metatarsals and three phalanges. The scapula is 2 feet 7 inches long; its greatest width 8½ inches, humerus 21 inches long. This specimen is No. 6, and was discovered by my son, Levi, a few rods from the carnivore.

We have a skull I discovered of *Stephanosaurus marginatus* (I also discovered the type in 1913 with much of the skin impression). The Maxillæ and dentaries show a beautiful series of teeth, both functional and the successional. There are at least 2,000 teeth in this species. It has a very narrow elevated crest. This induced Lambe to call it the crowned saurian. The teeth have minute denticles along the margins in the front part of the jaws, which are not so pronounced in the back part. Quite a number of the bones of the skeleton were found with this specimen.

I was so fortunate as to find a fine skull of *Monoclonius nasicornis* Brown. My son Levi has beautifully restored it. It lay on the side of a steep slope, part of one side washed down the hill. However, when they were restored, very little was missing. It is the best specimen my parties found in the four years we collected there. It is 4½ feet long, and as far as I know, equalled only by the type in the American Museum, New York, where they have the entire skeleton. I have described these dinosaurs in my recent book, "Hunting Dinosaurs in the Red Deer River, Alberta, Canada," and need not go into details here.

In addition to the dinosaurs collected, I secured a large collection of scattered bones that will be of value as hand specimens to illustrate the wonderful fauna of the Pierre age.

We secured some fine turtles. Two, in fact, have nearly perfect shells. One, Lambe's *Boremys pluchra,* a new species, Levi found in 1913. The other is evidently new, and is the only one I have found in the Belly River Series, either in Montana or Canada, where the ribs are not coössified to the margin. It resembles somewhat the sea tortoises of the Niobrara chalk of Kansas. Then we have a beautifully sculptured plastron of a new species of *Aspiderites,* a form that was not covered with horny scutes, half the plastron of a large *Adocus* that must have been three feet long in life. This shows the marks of very strong horn plates.

Glacial Moraines in the Vicinity of Estes Park, Colorado.

Lyman C. Wooster, State Normal School, Emporia.

While spending his August vacation near Estes Park village, the writer unexpectedly penetrated a region of enormous glacial activity of prehistoric times. Having given years to the study of the moraines of Kansas, Wisconsin, Michigan, Illinois, Indiana and Ohio, belonging to the great continental glacier that once covered the northern United States from Dakota to Cape Cod, the writer became at once interested in these moraines of the alpine glaciers of the Rocky Mountains that formerly filled the upper valleys of the Thompson river and its tributaries.

The introduction to the moraines came when a party of relatives and friends laid a picnic luncheon in the Thompson river at the gateway to Moraine Park. Giant bowlders filled the river, so we were safe from a wetting. The river here falls in cascades one hundred feet through and over the terminal moraine of a glacier that formerly filled Moraine Park. This glacier undoubtedly received tributary ice rivers down Forest, Spruce and Fern canyons and was in its time a glacier of no mean dimensions. It pushed but two or three miles beyond the mouths of the canyons, for it encountered a great glacier from the southwest